Center for Quality and Productivity Improvement
UNIVERSITY OF WISCONSIN
610 Walnut Street
Madison, Wisconsin 53705

(608) 263–2520
(608) 263–1425 FAX

Report No. 59

Teaching Quality Improvement by Quality Improvement in Teaching

Ian Hau

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Ian Hau, PhD

Center for Quality and
Productivity Improvement

University of Wisconsin
Madison, Wisconsin

ABSTRACT

In response to disturbing challenges ahead, leaders at the University of Wisconsin–Madison are committed to transform the institution to a Total Quality University. As a pilot project in the transformation, this paper describes how students and the instructor worked as a team to improve the quality of teaching in a class. Treating students as *customers*, the team identified 50 areas that affected the quality of teaching. A class survey revealed six areas where most students indicated problems. The instructor then implemented changes which dramatically reduced the *defect* rate as viewed by the customers in these areas. For example, the defect rate dropped from 78% to 22% for computer instruction, 56% to 8% for blackboard presentation, and 82% to 20% for overhead presentation. The team also developed a system to transfer their knowledge to the next team to ensure never-ending improvement in the future.

KEYWORDS: Education, Customers, Total Quality Management, Deming's PDCA Cycle, Seven-step Method, Seven Problem-solving Tools, Total Quality University, Continual Improvement System, Double Pareto Diagram.

Teaching Quality Improvement by Quality Improvement in Teaching

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In response to disturbing challenges ahead, leaders at the University of Wisconsin–Madison are committed to transform the institution to a Total Quality University. As a pilot project in the transformation, this paper describes how students and the instructor worked as a team to improve the quality of teaching in a class. Treating students as customers, *the team identified 50 areas that affected the quality of teaching. A class survey revealed six areas where most students indicated problems. The instructor then implemented changes which dramatically reduced the* defect *rate as viewed by the customers in these areas. For example, the defect rate dropped from 78% to 22% for computer instruction, 56% to 8% for blackboard presentation, and 82% to 20% for overhead presentation. The team also developed a system to transfer their knowledge to the next team to ensure never-ending improvement in the future.*

INTRODUCTION

According to John Wiley, Dean of the Graduate School, and Michael Williamson, Director of the Office of Quality, at the University of Wisconsin–Madison (1990), the University will face disturbing challenges in the next ten years. For example, recruiting costs (startup costs only) for new faculty by the year 2000 are projected to be $14 million per year, an almost three-fold increase compared with $4.9 million in 1990. Due to demographic changes in the United States, a serious shortage of Ph.D graduates is also anticipated by the year 2000. One consequence is that only about 0.8 job candidates will compete for each faculty position by the year 2000 (Bowen and Sosa, 1989). The problematic challenges are further deepened by continually shrinking financial resources, due largely to the federal deficit and the nature of the Wisconsin state economy. These challenges can be summarized in one sentence: the University must do *more* with *less*, and at the same time produce *higher quality* "products".

In response to the challenges ahead, leaders at the University of Wisconsin–Madison are committed to transform the institution to a Total Quality University: a new management team has been formed, comprehensive strategic planning has been done, new management methods have been employed, and pilot projects have been initiated.

One reason for "doing more with less" in teaching at the University is that classes are becoming larger. This means that the institution must produce more quality students with fewer instructors, teaching assistants and (computing) facilities. As one of the pilot projects of the transformation to a Total Quality University, this paper describes a case study on improving the teaching of Business 570, a large undergraduate class in Business Statistics at the University of Wisconsin–Madison. In this project, the instructor (i.e., the author) and six students in the class formed a **quality team**. Treating and listening to students as *customers*, the team improved the quality by continually reducing and eliminating *defects* in the teaching process. To do that, the team developed an improvement strategy called the SIAM Cycle. The SIAM Cycle is a repeated use of four steps: Study current situation, Identify vital problems, Act on problems, and Monitor progress. By employing the SIAM cycle, the team identified 50 areas that affected the quality of teaching in the class. Out of these 50 areas, a survey revealed six areas with which most students have problems. The instructor then implemented changes which greatly improved the quality of teaching. For example, the defect rate, defined as the percentage of students who have problems, dropped from 78% to 22% for computer instruction; 56% to 8% for blackboard presentation; and 82% to 20% for overhead presentation (See

Figure 7). The team also proposed and applied a strategy called the **Continual Improvement (CI) System**. This system consists of three components: *Current Situation* indicating the position where the current team left off, *Dynamic Process Chart* providing a map for the next team of the road ahead, and *Experience Database* serving as a mine-detector warning of hidden hazards along the road. This system is a tool to transfer the knowledge gained by this team to the next team so that never-ending improvement can be ensured in the future.

BACKGROUND

Business 570 is an introductory course in Business Statistics and is required for all undergraduate students in the School of Business at the University of Wisconsin-Madison. In the semester of the study, there were 162 students enrolled in the course. The course emphasized problem-solving techniques for quality and productivity improvement. The first two weeks of the semester the class discussed modern problem-solving tools such as the Seven-Step Method (Joiner, 1990) and the Seven Tools (Ishikawa, 1971) for quality improvement. These techniques were illustrated through real case studies from industry.

The instructor wanted to design a project so that students would have an opportunity to:

- implement the techniques they just learned from the class, and witness their effectiveness for improving quality;
- learn about practical difficulties in putting concepts to work;
- see changes throughout the improvement process; and
- learn about teamwork.

The project selected was to improve the quality of teaching the class while teaching the class.

PLANNING

FORMING THE QUALITY TEAM

The first step of the project was to select team members to work on improving the quality of teaching. The planned structure of the team is shown in Figure 1.

The instructor, who served as a facilitator of the team, recruited six student members: a team leader, a typographic designer, and one representative from each of the four discussion sessions. The students

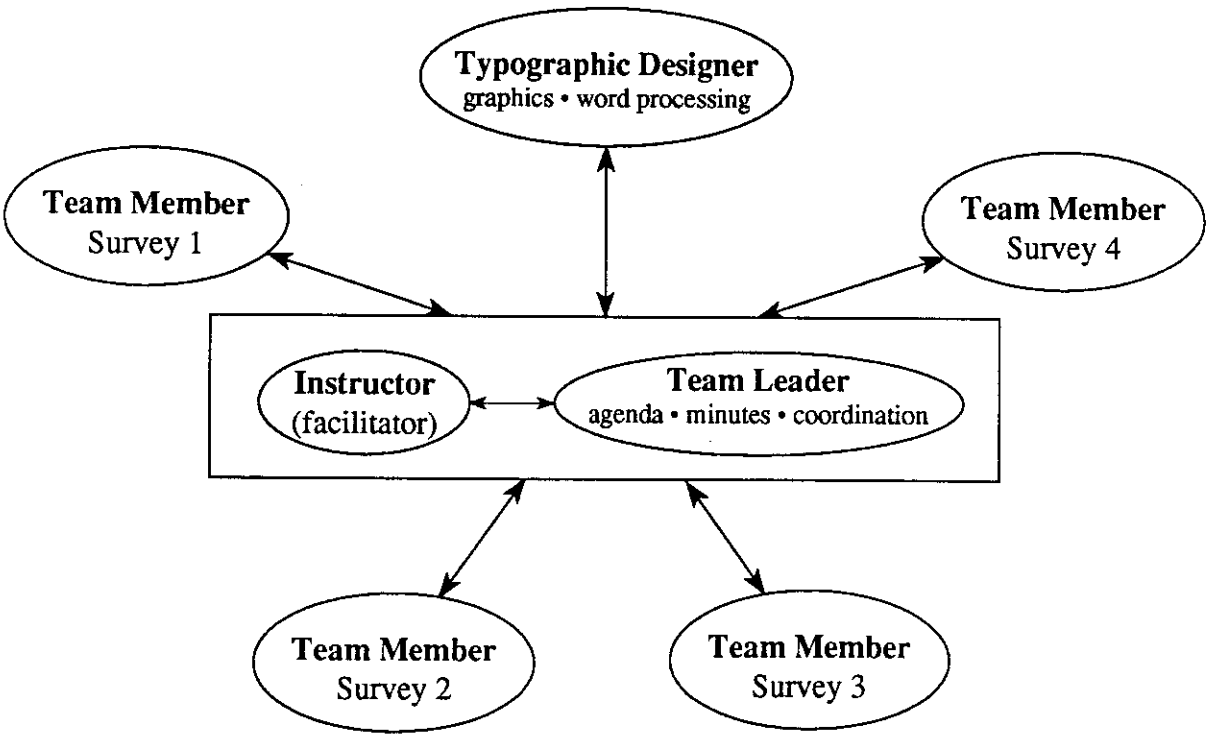

Figure 1 *Structure of the Quality Team*

participated voluntarily. Rewards for doing the project were not discussed when recruiting. However, the instructor later decided to give extra credit to student participants in the quality team towards their final grades. The instructor chose a student who had substantial work experience as the team leader. This choice turned out to be a key factor in the success of the project.

TEAMWORK

As shown in Figure 1, the instructor served as a facilitator of the team. The team leader was responsible for coordination among the team members, and preparation of agenda and minutes of the meetings. One team member was responsible for typesetting and graphics. The other four students were responsible for doing urveys and obtaining feedback from other students in their discussion sessions.

The following were considered to be important for this project:

- Running an effective team meeting. The team followed the guidelines provided by Peter Scholtes in *The Team Handbook* (1989).
- Developing job definitions for all team members early in the project.
- Producing minutes of every meeting within a week. Everyone was given a typewritten copy of their responsibilities and deadlines.
- Having survey results analyzed by a team member, polished by the typographic designer, and fed back to all team members within a week.
- Having students in the quality team reporting on the project's progress during class. This is an opportunity for the team to gain recognition, as well as feedback from all the students.
- Maintaining a database of the experience the team members gained during the project.

IDENTIFY THE CUSTOMERS

There are three broad areas that affect the quality of teaching in this class:

1. The content of the course material.
2. The delivery of the course material.
3. The evaluation of students.

Different aspects of the teaching function have different customers. For the "content" of the course materials, the students are the products, with the knowledge gained from the course as "added value". Customers for the course's content may be the students' future employers. As far as the evaluation of students is concerned, students may not be the main customers. They cannot judge, for example, the content of the

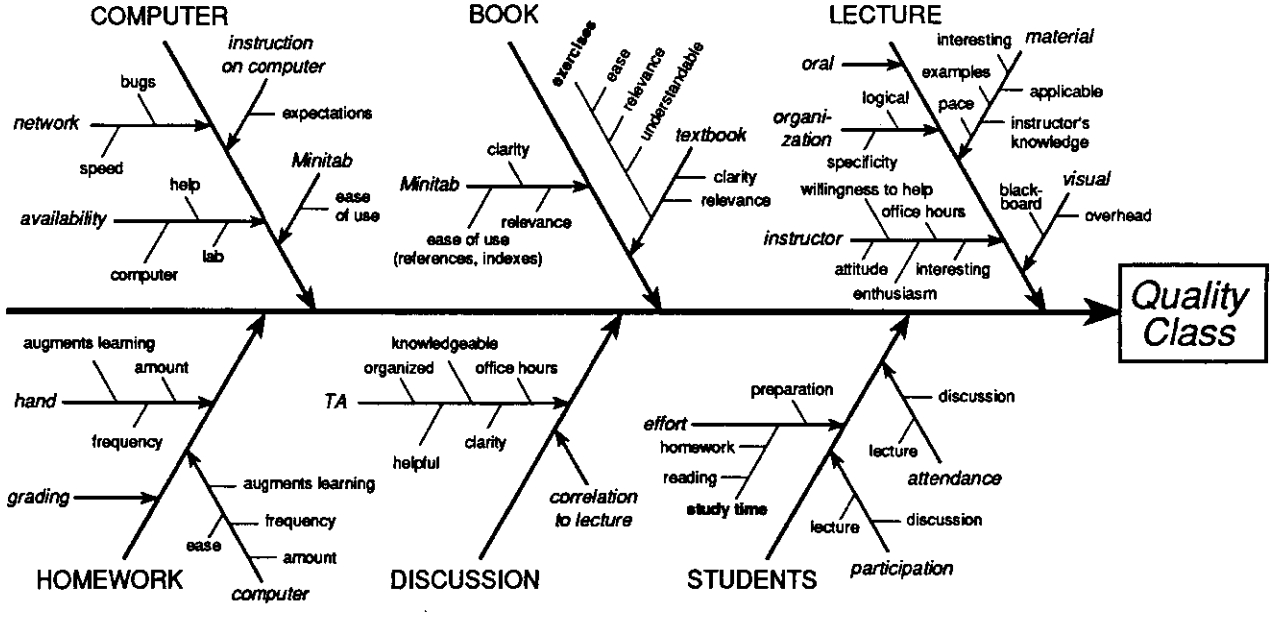

Figure 2 *Cause-and-effect diagram for a Quality Class.*

examinations. However, students are the *primary customers* for the *delivery* of the material. As a first step to improve the teaching, this project focused on the delivery aspect since the customers (students) were easier to reach.

STRATEGY FOR QUALITY IMPROVEMENT

Before we could make improvements, we had to know what affects the quality of teaching in our context. Accordingly, the team members had a brainstorming session. Figure 2 shows the resulting cause-and-effect diagram (Ishikawa, 1971).

The figure shows six main areas that contribute to the quality of the class: Lecture, Textbooks, Computer, Homework, Discussion and Students. Within the lecture category, for example, the visual delivery, the oral delivery, the material taught, the organization of lectures, and the instuctor's attitude are important. These items are broken down further, as shown in the figure.

After having obtained many ideas of what affected the quality of the class, the next step was to develop an improvement strategy. While Deming's Wheel (Plan–Do–Check–Act) is a useful concept, the instructor found it difficult to teach and follow. Based on Joiner's Seven-Step method (1990) and Deming's Wheel, the instructor developed the improvement strategy called the SIAM Cycle, as shown in Figure 3. The strategy involves a repeated use of the steps of SIAM: Study current situation, Identify vital problems, Act on problems and Monitor progress.

THE SIAM CYCLE

STUDY CURRENT SITUATION

Since there were no past data, all the areas in the cause-and-effect diagram shown in Figure 2 could be potential problems. When the quality team formed, there were 11 weeks left in the semester, and the first examination was approaching. The team thought students' judgement of the class might be dominated by their examination results. To avoid "after-examination bias", the team decided to conduct a survey before the first examination.

IDENTIFY VITAL PROBLEMS

A survey was proposed to identify the vital problems in the cause-and-effect diagram. The survey was to be short enough to be filled out within ten minutes—

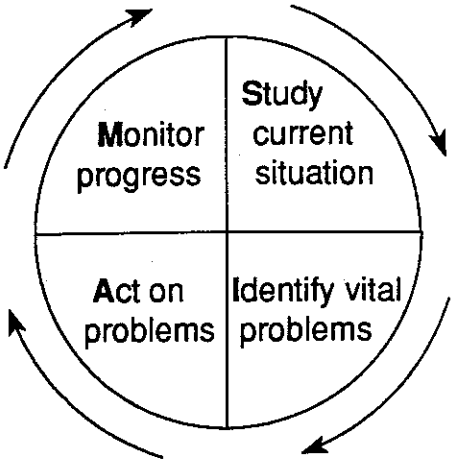

Figure 3 *Improvement Strategy—SIAM Cycle*

about 25 to 30 questions. Under this time constraint, we could not ask questions in all the areas shown in Figure 2. The team decided that the survey would have roughly 40% of the questions on Lecture, 15% on Discussion, 15% on the Computer, 10% on Homework, 10% on the Textbook, and 10% on Students. With these considerations, the team designed the survey form shown in Appendix A.

The data from 120 surveys were included in the analysis. The results are displayed in Figures 4, 5, and 6.

In Figure 4, the height of each vertical bar indicates the magnitude of the problem in the area abbreviated on the horizontal axis. For example, Question 1 in Survey 1 was:

1. The material covered is presented in an organized way.

1	2	3	4	5
strongly disagree				strongly agree

The vertical bar in this case is the percentage of students who checked either 1 or 2, which we regarded as indicating problems. The choices in Questions 3, 4, 5 and 6 are of different nature. For example, Question 3 was:

3. The pace of this class is

__ ① way too fast,
__ ② too fast,
__ ③ about right,
__ ④ too slow,
__ ⑤ way too slow

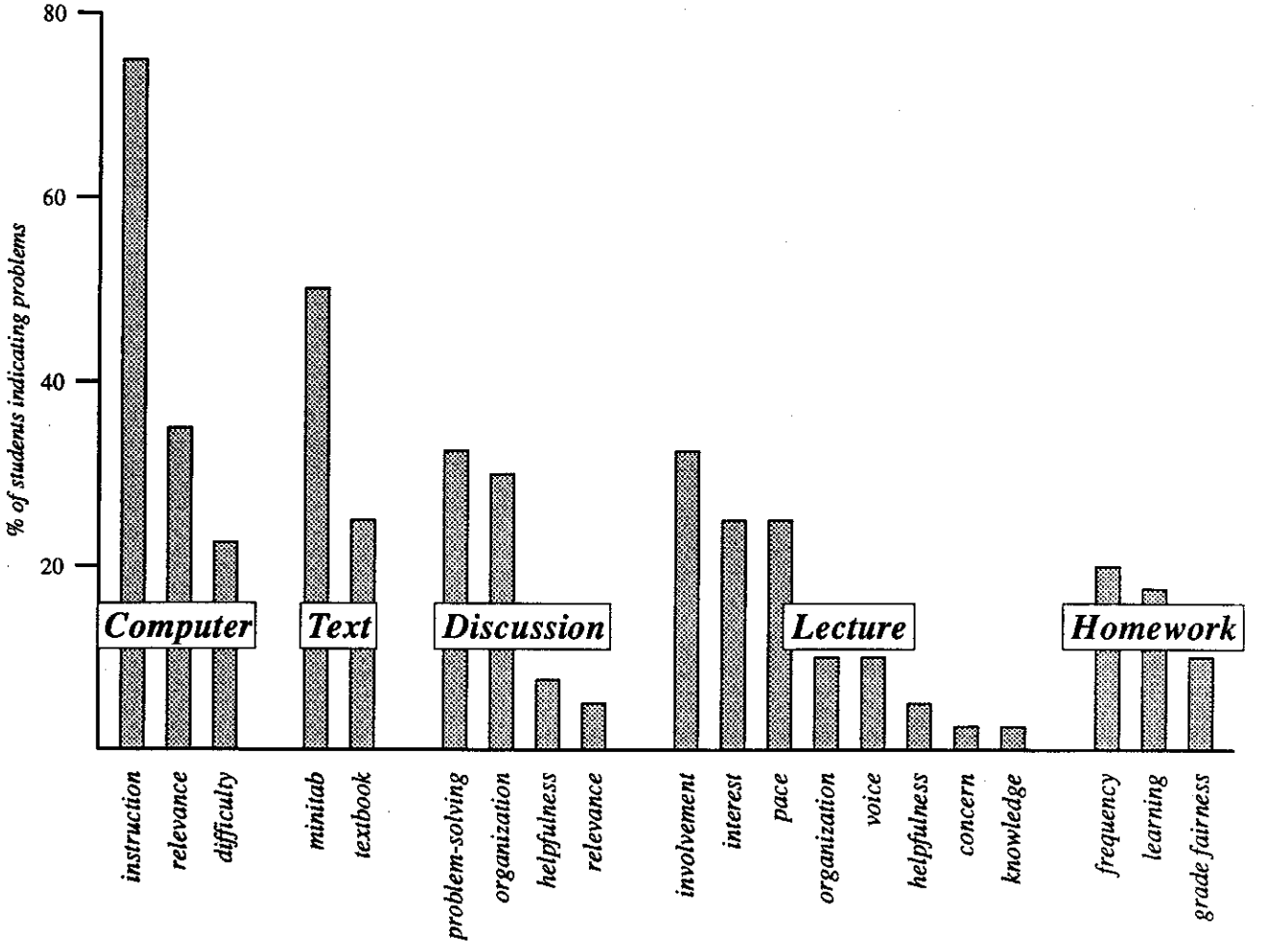

Figure 4 *Double Pareto diagram of Survey 1 results*

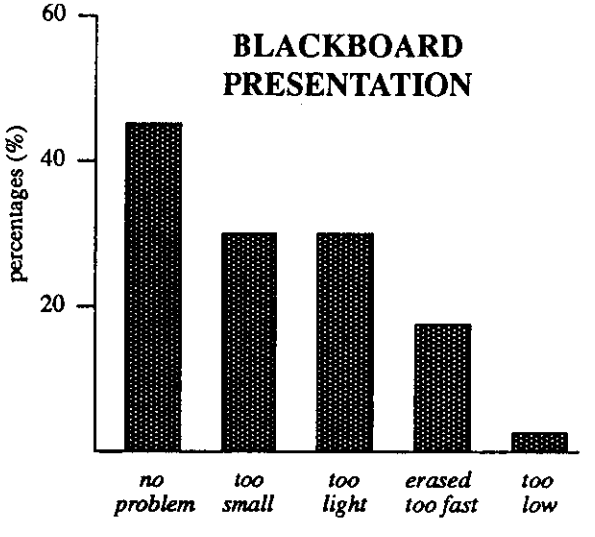

Figure 5 *Survey 1, Problems with blackboard presentation*

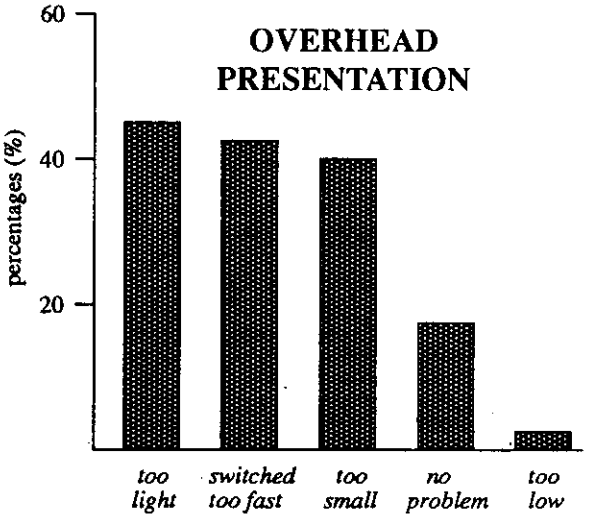

Figure 6 *Survey 1, Problems with overhead presentation*

In this case, the vertical bar is the percentage of students who did not check 3. Questions 4 and 5 concerning the problems with blackboard and overhead presentations are displayed in Figure 5 and 6, respectively.

We propose a graphical presentation called a **Double Pareto Diagram**, as shown in Figure 4. It was constructed in the following way. The five groups COMPUTER, TEXT, DISCUSSION, LECTURE and HOMEWORK were ranked by the *average height* of the bars in each group from the highest to the lowest. Then within each group, the bars were organized from the tallest to the shortest. From this Double Pareto Diagram we can, at a glance, identify the main problem area(s) and then the leading cause(s) of the problem. In this case, COMPUTER was the main problem area and the leading cause of it was insufficient instruction. The second problem area was TEXT, in which the use of the computer textbook was difficult. The next problem area was DISCUSSION. The two leading problems in discussion sessions were insufficient numerical examples and their organization. In the LECTURE area, insufficient class involvement surfaced as the main problem. The problems in HOMEWORK seemed relatively small.

For blackboard presentation (Figure 5), only 45% of the students did not find any problem. The other 55% students found the writing on the blackboard too small, too light, too quickly erased or too low. For overhead presentation, 82% of the students indicated problems of some sort.

ACT ON THE PROBLEMS

The data indicated the following were the vital problems at the time of Survey 1 (week 6 of the semester):

1. 78% of the students thought instruction on using the computer was insufficient.
2. 50% of the students found the computer textbook difficult to use.
3. 30% of the students stated that not enough problem-solving examples were given in discussion sessions.
4. 30% of the students thought discussion sessions were not well-organized.
5. 32% of the students found the instructor did not involve the class enough in the lecture.
6. 56% of the students had difficulties with the blackboard presentation at some time.
7. 82% of the students had difficulties with the overhead presentation.

Regarding computer instruction, the students were supposed to determine the computer commands required to do data analysis. The students usually needed to write a program of five to ten commands. The instructor regarded this as important training, and this had been done in previous years. However, further investigation revealed that the students used on average 80% of their study time on computer homework but did not "get much out of it". The instructor thought that students should not spend more than 30% of their time on computer assignments. Therefore, all program commands were given to the students to reduce the time spent on computer homework. To help students "get more out of computer homework", the important points of the problems were highlighted when assigned and were discussed afterwards. The team thought that these changes might also take care of the problem with the computer handbook.

The team gave some suggestions to the teaching assistant regarding opportunities to improve the discussion sessions. They decided to work out more numerical problems related to the homework.

The team could not find any feasible solution regarding the problem with class involvement. The instructor tried asking more questions and calling on specific students. However, most students were reluctant to participate. It was difficult to involve the class more, because of the class size and time constraints.

The instructor was very surprised at the problems with blackboard and overhead presentations. Before a lecture started, the instructor usually went to the back of the class to check if the visual aids were legible. He also asked the class if anyone had problems seeing the writing. No one expressed any problem. Yet the survey told a completely different story! When confronted with the data, the instructor was perplexed:

> *"How can I make the printing on the overheads bigger? I use 24 point font size and have the printing enlarged 150% on a copy machine. Any bigger would mean two words per line!"*

> *"How can I make the printing darker? All my overheads are in bold type already!"*

> *"How big do they want me to write? My*

writing on the blackboard is HUGE *already!"*

"There are only three or four pages of notes in each lecture. And they think I erase too fast?"

However, since the data never "gave in", the instructor did. He decided to do further investigation. The instructor conjectured that the main problem might be that the blackboard writing was *too thin*. Therefore the instructor went to the bookstore and asked for thicker chalk. He found some sidewalk chalk that was five times thicker than ordinary chalk, and switched to it.

For the overhead presentation, the instructor thought that the position of the projector might be the real problem. The classroom was about 20 feet wide and 45 feet deep. In front of the blackboard there was a two-foot high platform. The first row of seats was about three feet away from the platform. The overhead projector was on a table at the right corner of the platform and the transparencies were projected onto the screen at an angle. As a result, the printing on the overheads was distorted. However, if the projector was put in the middle, some students' views would be blocked. Putting the projector in the right corner seemed to be the best compromise when the choice was limited to the platform area. However, the data clearly indicates that the instructor had to find other alternatives. The instructor finally decided to move the middle three seats in the first row and put the projector there. The new position provided bigger and less distorted images on the screen.

MONITOR PROGRESS

Were these changes useful? We needed data to answer this question. A second survey was done three weeks after the first one. Survey 2 focused on the vital problems which the team identified and dealt with after Survey 1. Appendix B shows a copy of Survey 2. Figure 7 compares the results of Survey 1 and Survey 2.

As we can see from the figure, all the changes were effective. In particular, blackboard presentation, overhead presentation, and computer instruction improved dramatically. More detailed comparisons on these three areas are displayed in Figures 8, 9 and 10.

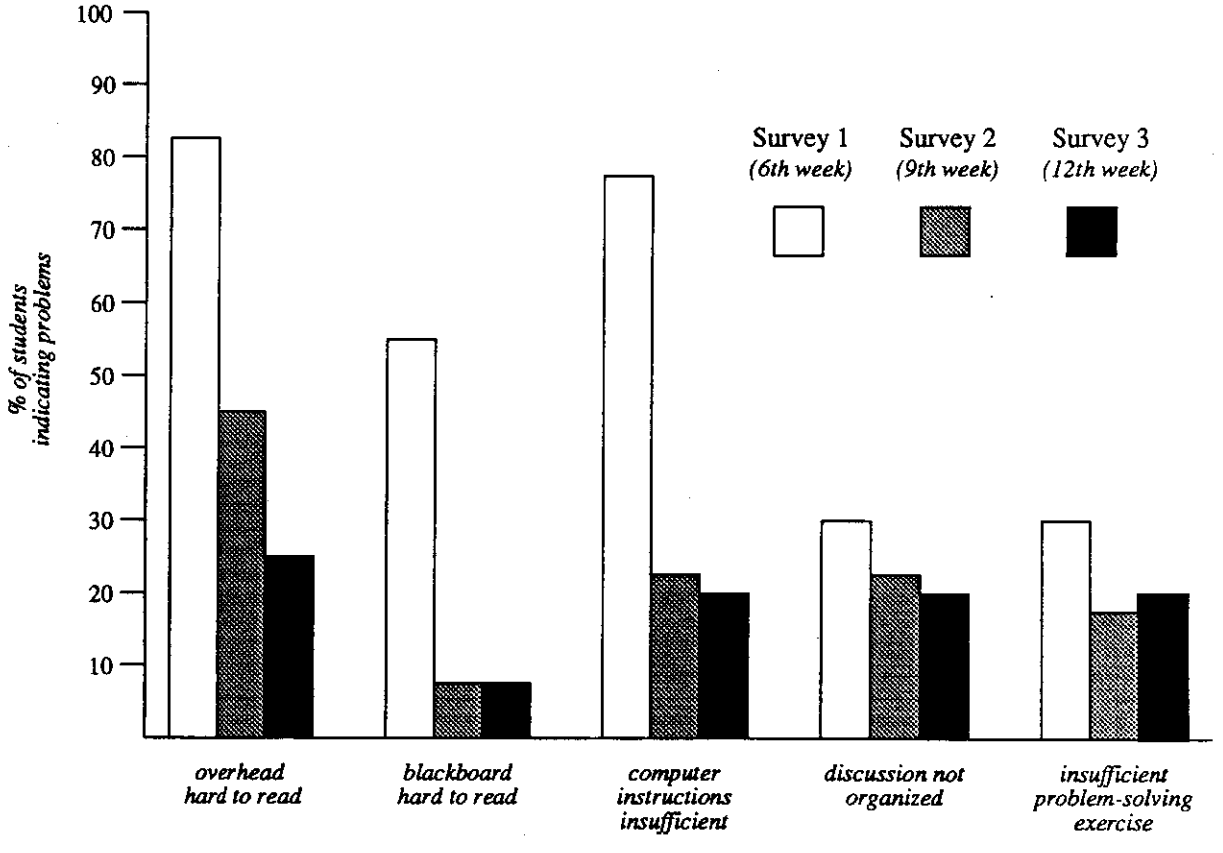

Figure 7 *Improvement in teaching at weeks 6, 9 and 12*

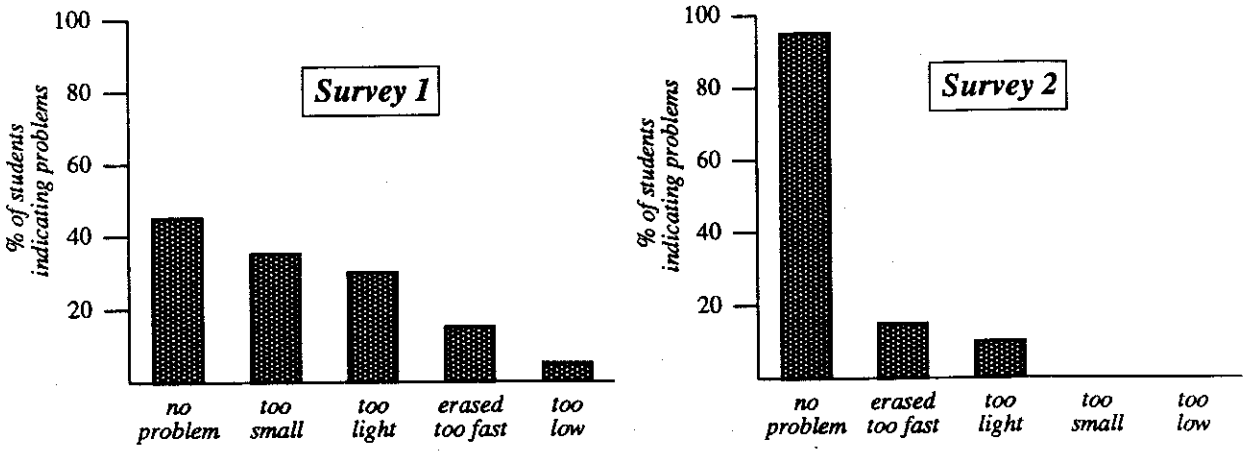

Figure 8 *Improvement in blackboard presentation*

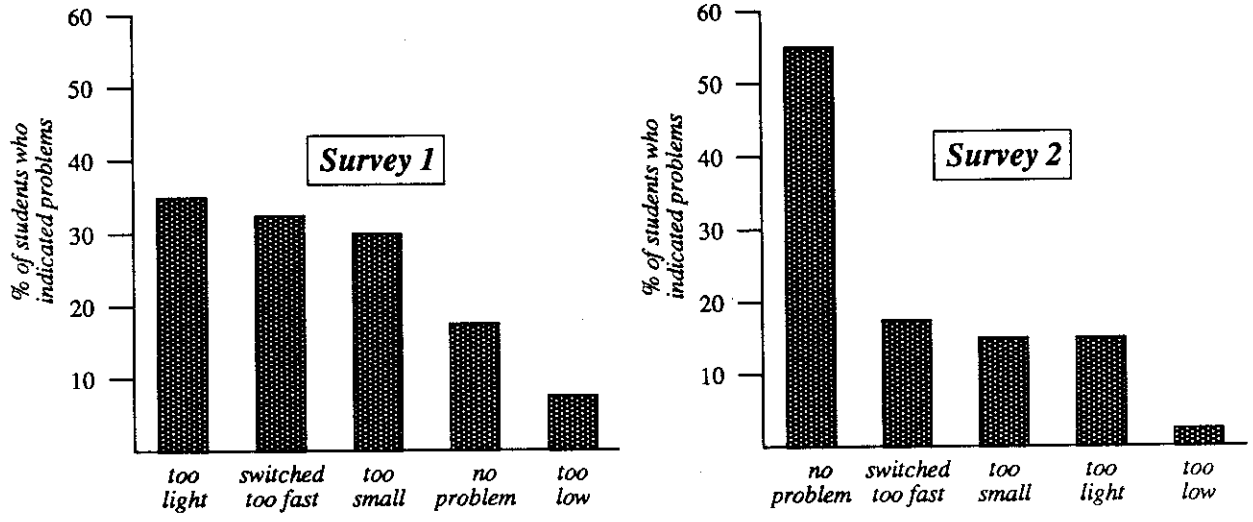

Figure 9 *Improvement in overhead presentation*

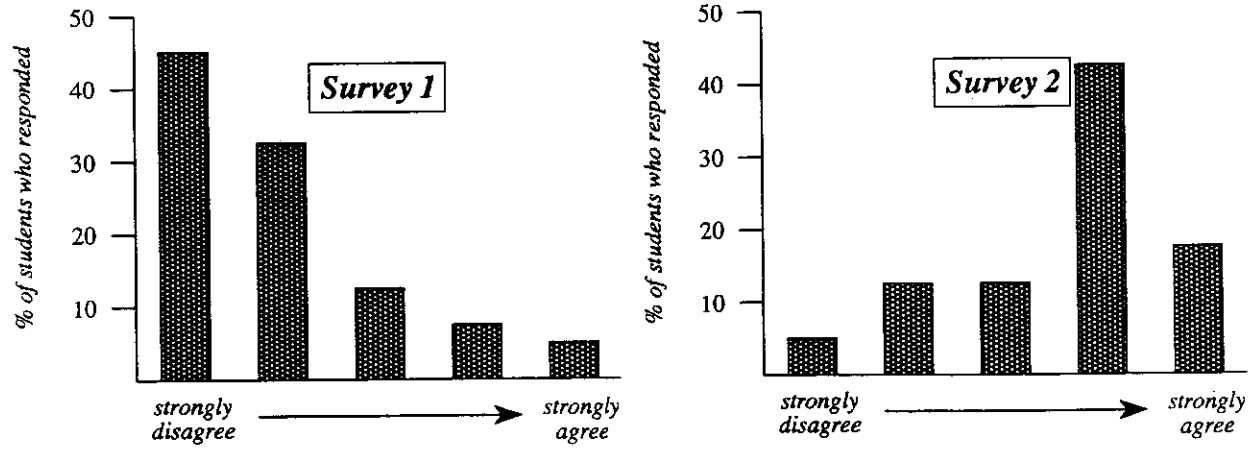

Figure 10 *Improvement in computer instruction*

To summarize, the percentage of students who indicated problems with

- overhead presentation dropped from 82% to 46%;
- blackboard presentation dropped from 56% to 8%;
- computer instruction dropped from 78% to 22%;
- discussion organization dropped from 30% to 22%;
- problem-solving in discussion sessions dropped from 30% to 18%; and
- the pace of lecture dropped from 24% to 9%.

KEEPING THE SIAM CYCLE ROLLING

By week 9 in the 15-week semester, we had gone through the SIAM cycle once. We had seen substantial improvements in certain areas. The changes we made greatly reduced the problems identified in Survey 1. The next step was to make sure these improvements would be sustained. Survey 3 conducted in lecture during week 12 of the semester served this purpose (see Figure 7). The data show that the improvements made after Survey 1 remained intact.

Student comments from Surveys 2 and 3 also resulted in a number of changes:

- While additional computer instructions were helpful, the students were still "frustrated". Therefore, the instructor tried providing computer output for the students. The students only needed to interpret the output.

- Students suggested holding a review session before each examination. This was done for the second and final examinations.

- Students requested more time for the examinations. The time was therefore increased from 60 minutes to 90 minutes.

- Students had problems flipping back and forth to see the graphs and questions during the first examination. For the second and final examinations, different-colored paper was used for the questions and graphs and they were stapled separately.

- Upon request, the instructor provided answers for the practice examinations.

In the last week of the class, Survey 4 was conducted in lecture to check overall progress for the semester. Most of the questions from Survey 1 were used again in this final survey in order to facilitate a direct comparison. The Pareto Diagrams in Figure 11 shows the results related to the lectures.

The data show that the changes since Survey 1

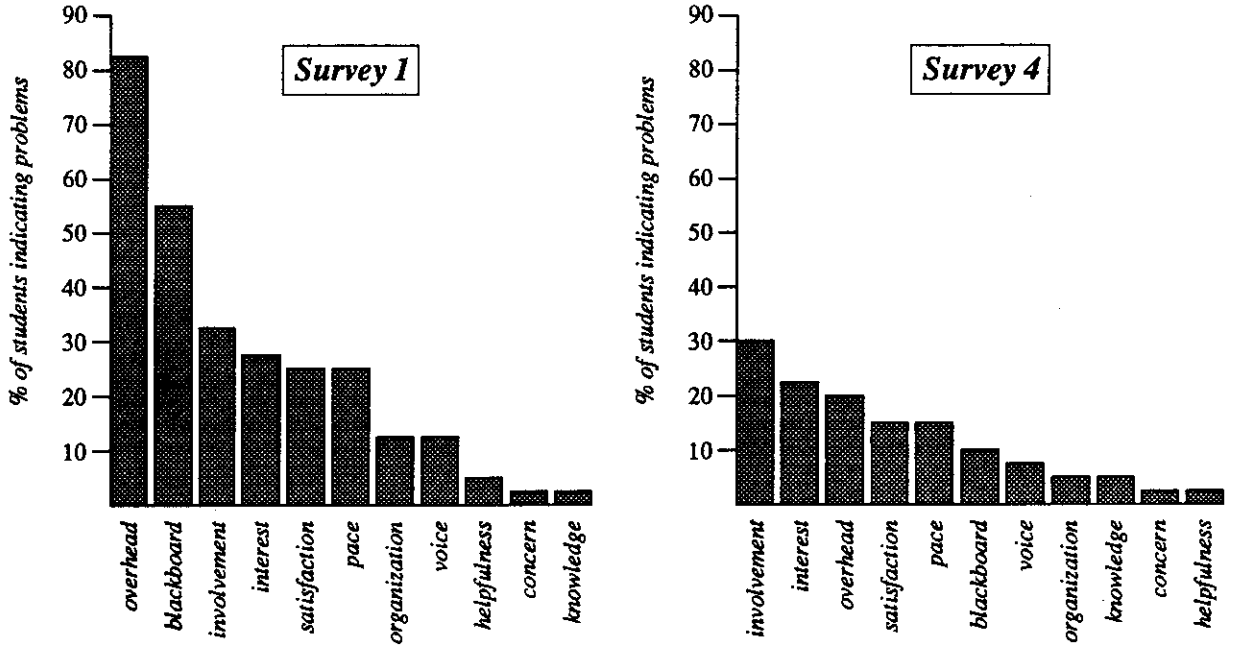

Figure 11 *Improvement in lecture problems in one semester*

had been effective in reducing the problems. In particular, improvements in blackboard and overhead presentations were dramatic. Class involvement still appeared as a leading problem in Survey 4. However, this was expected since the team did not implement any solution to this problem after Survey 1. We recommended that the next team study this problem in more detail.

The Double Pareto Diagram in Figure 12 also summarizes problems in other areas.

Compared to the Double Pareto Diagram (Figure 4) from Survey 1, we make the following observations:

- All the changes made since Survey 1 helped reduce the respective problems.
- The problem-solving exercise and organization of the discussion sessions were somewhat improved. Yet the students thought the discussion sessions were less helpful. The next team may need to investigate what our customers (students) really need and want from discussion sessions.
- Under the resource constraints such as limited computers and teaching assistants, almost 90%

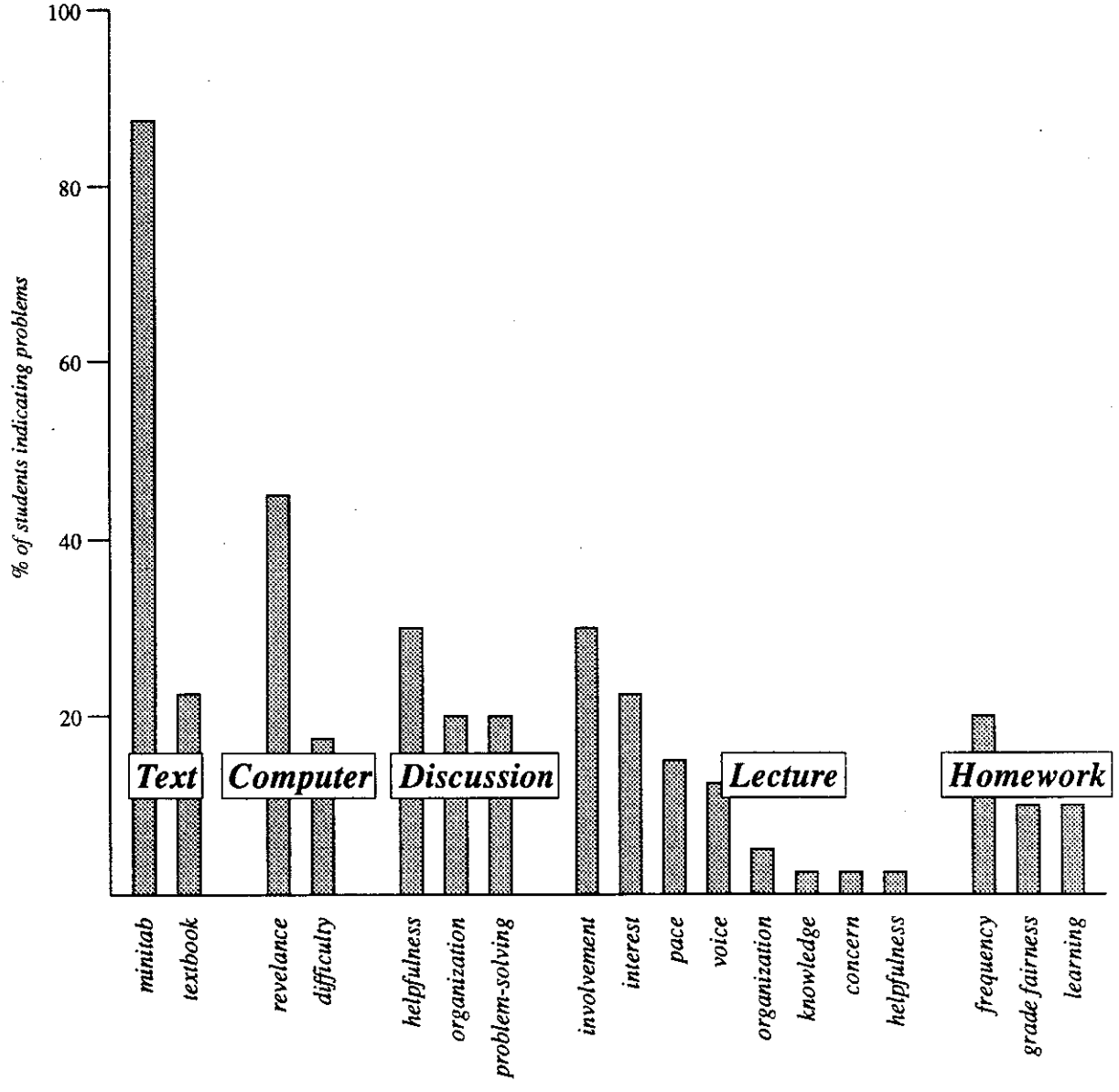

Figure 12 *Double Pareto Diagram of Survey 4 results*

of the students did not think that the computer handbook was useful. At first, this seemed surprising since students expressed less of a problem with the computer homework. After some investigation the reasons became apparent. When the students needed to identify the computer commands, they had to spend much time reading the computer book. When additional computer instructions were given, there was less need to use the book. In response to this problem, next semester the instructor will provide a quick reference card on using the computer. The computer book will serve only as a reference instead of a required text for the course.

- 45% of the students thought the computer homework did not enhance learning. This problem needs further investigation.

The computer aspect of the course had been a major concern. The instructor had experimented with different methods to make computer learning more effective. At the beginning of the semester, the students were required to identify the computer commands for their homework. After Survey 1, the instructor provided all the computer commands. Towards the end of the semester, the instructor provided the students with computer output. In Survey 4, the students were asked which of the three methods most enhanced their learning. The result was that 4% of the students favored "no commands given", 65% favored "commands given", and 31% favored "output given". Therefore, next semester the instructor will provide students with the commands for their computer assignments, unless future data suggest otherwise.

Let us hear what our customers, the students, said about the quality improvement effort in the last survey:

"The (quality improvement) efforts were very effective. A marked change followed the surveys."

"Great effort! There has been significant improvement."

"I think the surveys given have greatly improved the quality of the class. People can be honest and open on a survey so we know what the real problems are. The quality team did a great job."

"The quality improvement impressed me and it gave me a better attitude when I could state my opinion and see changes being made. Keep doing this!"

CONTINUAL IMPROVEMENT SYSTEM: HOW TO DEFEAT SISYPHUS

The quality team this semester substantially improved the quality of the course. However, if we rely solely on this quality team to roll the SIAM cycle uphill, the cycle may very well roll down again when the team leaves. The next team will then start rolling the cycle up again from where the previous team began. Thus, we will find ourselves a modern-day Sisyphus, the legendary king of Corinth condemned to roll a heavy stone up a steep hill, only to have it roll down again as it nears the top.

How can we increase the chance that the next team starts rolling the cycle from where the current team left off? How can we transfer the key experience to the next team?

A system to answer this need includes documentation of where the current team left off, a map for the next team of the road ahead, and a mine-detector warning of hidden hazards along the road. The Continuous Improvement (CI) System serves this purpose. A **CI System** is a document consisting of three components: *Current Situation*, *Dynamic Process Chart*, and *Experience Database*.

CURRENT SITUATION

This includes a list of the problems identified by the team but not yet approached. Ideas on possible changes should also be recorded. This will become the current situation when the next team picks up the project. Figure 13 shows the Current Situation developed by the team.

DYNAMIC PROCESS CHART

George Box, a professor at the University of Wisconsin–Madison, once said that:

"The best time to run an experiment is after you have run it."

The same wisdom applies to team projects. The team that has just completed a project has better ideas on how to do the project again. Therefore, they can provide the next team with important input for the project planning. To do that, we propose a tool called

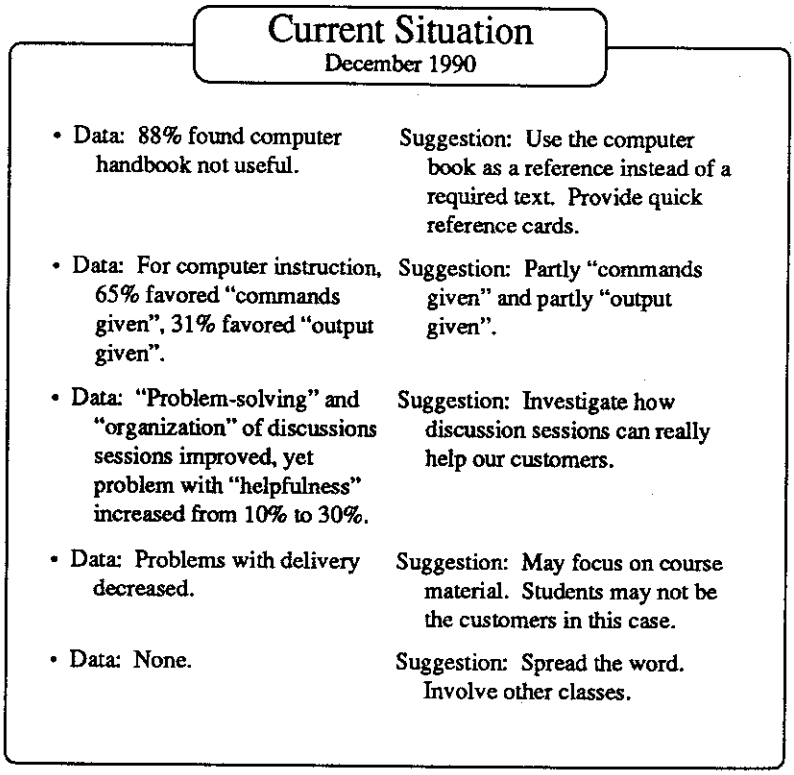

Figure 13 *The CI System: Current Situation*

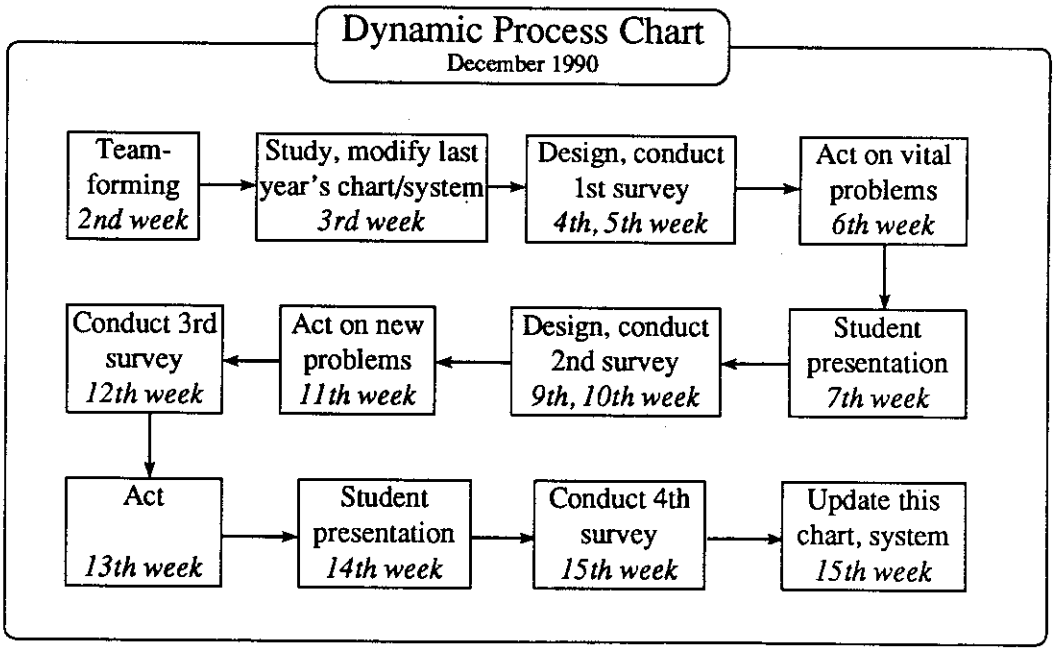

Figure 14 *The CI System: Dynamic Process Chart*

a Dynamic Process Chart, which serves as a road map for the next team. The Dynamic Process Chart developed by the current quality team is shown in Figure 14. As a first step shown in the chart, the next team is recommended to read last year's report to "retrieve" previous experience. If necessary the next team can modify the process chart according to their situation. The last step is to do the planning for the

Experience Database
December 1990

Teamwork

- The dates for all future meetings are to be determined in the first meeting. Bi-weekly meetings are suggested.
- Discuss job definitions with team members in the first meeting.
- Present minutes in outline format.
- Minutes including decisions reached and "to do's" are to be typed and distributed to all team members within a week.

Surveys

- Conduct a ten-minute training session in filling out surveys. Put emphasis on writing constructive comments that help improve the class.
- Always leave room for written comments.
- Ask students to rank the importance of each problem. In the Pareto analysis, the frequency and the importance of a problem are to be studied jointly.
- Ask students to write down the three biggest problems they encountered regarding the quality of teaching.

Documentation

- Designate a person to maintain and continually update the experience database. Make it a regular item on the agenda. Do not wait until the end to collect the experiences of the team members.

Changes Made

- Used bigger chalk (sidewalke chalk) for blackboard writing.
- Changed the position of the overhead projector. Remember that the position is room-dependent, and size-dependent even for the same room.
- Gave out commands for computer homework.
- Reduced computer homework.
- Highlighted important points of computer homework.
- Gave partial solutions to assignments.
- Held a review session before each examination.
- Used different-colored paper for graphs and questions in examinations. Had them stapled separately.
- Increased the examination time from one hour to one hour and thirty minutes.
- Provided answers for practice examinations.

Figure 15 *The CI System: Experience Database*

next team by updating the current process chart, in light of their additional experiences. Under this system, every team follows the plan provided by the last team, and upon completion of their project, provide a plan for the next team. These two steps generate the energy for system evolution.

EXPERIENCE DATABASE

According to the plan, the next team will start where the last team left off and will navigate using the road map left by the last team where they will be going. However, continuous improvement still may not take place because of hidden hazards along the road. The experience database serves as a mine-detector. Figure 15 shows the Experience Database developed by the quality team during the semester of the study.

It is important for the CI System to be short and easy to read. The picture book style documentation of the CI System shown in Figures 13, 14, and 15 is inspired by the teaching of Dr. Brian Joiner, a consultant for Total Quality Management.

The relation between teamwork and the CI system can be described by Figure 16. This diagram is inspired by the iterative learning process idea of George Box (1957). At the beginning, the team develops a system. The system drives the next team for incremental improvement. During this improvement process, the new team gains additional knowledge. The new knowledge enables the team to improve on the previous system. Therefore, a new cycle of incremental improvement is initiated. Iteratively applying the process shown in Figure 16 contributes toward fast and never-ending improvement.

SUMMARY

One way to improve quality in manufacturing is by never-ending reduction and elimination of defects; and there is no difference in teaching. Is your teaching "*defect free*"? If yes, how do you know? If no, what are you doing about it? Will it improve the quality of your teaching? How do you know?

Schools across the country are facing the challenge of teaching more students with less resources, and improving the quality of the education all at the same time. In this paper, we have described the process to improve the quality of teaching a large class. To do that, we formed a quality team. We rolled the SIAM Cycle uphill by studying the current situation, identifying vital problems, acting on problems, and monitoring progress. We also created the CI system to ensure continual improvement in the future. As a result, the changes made during the semester greatly reduced the defects in the teaching process.

All changes were small, however, data showed that the impact was large. None of these is difficult to understand. None of these is easy to do. It takes courage. The courage to identify defects. The courage to improve.

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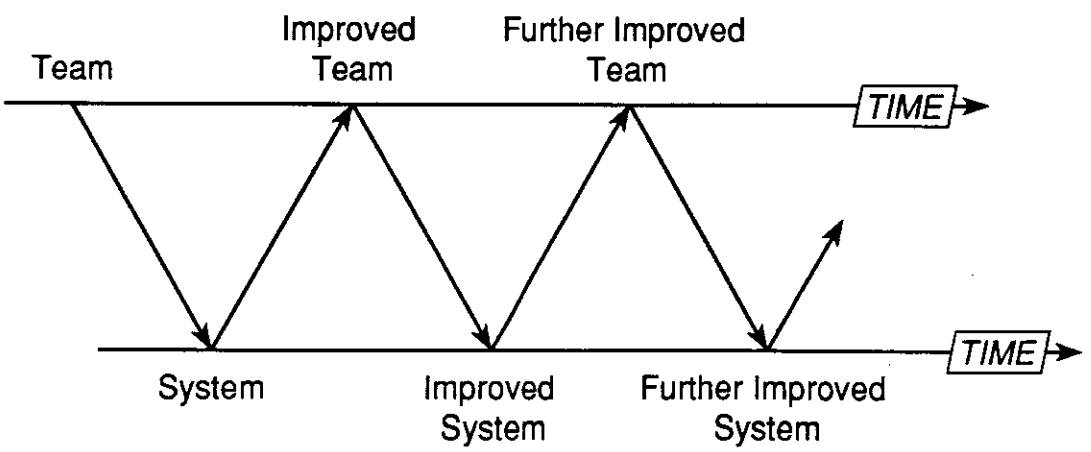

Figure 16 *Evolution of team and CI system*

ticular that of treating students as customers. Robert Miller also provided great support throughout the project.

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Appendix A

BUSINESS 570 SURVEY 1 10-15-90 P.1

Your discussion is: 301 302 303 304

A. LECTURE

1. The material covered is presented in an organized way.

1	2	3	4	5
strongly disagree				strongly agree

2. The instructor makes the material interesting.

1	2	3	4	5
strongly disagree				strongly agree

3. The pace of this class is

1) way too fast
2) too fast
3) about right
4) too slow
5) way too slow

4. Which of the following are problems with the blackboard presentation:
(you may check more than one)

____ too small
____ too light
____ too low
____ erased materials too soon
____ no problem

5. Which of the following are problems with the overhead presentation:
(you may check more than one)

____ too small
____ too light
____ too low
____ switched slides too fast
____ no problem

6. The instructor gets the class involved.

1) way too much
2) too much
3) about right
4) too little
5) way too little

7. You can hear the Professor's voice clearly.

1	2	3	4	5
strongly disagree				strongly agree

8. The instructor is knowledgable with the material.

1	2	3	4	5
strongly disagree				strongly agree

9. The instructor cares about the class.

1	2	3	4	5
strongly disagree				strongly agree

10. The instructor is willing to help.

1	2	3	4	5
strongly disagree				strongly agree

11. Rate your overall satisfaction with the lecture:

1	2	3	4	5
very unsatisfied				very satisfied

B. COMPUTER

12. The instruction in using the computer is sufficient.

1	2	3	4	5
strongly disagree				strongly agree

13. The use of the computer is easy.

1	2	3	4	5
strongly disagree				strongly agree

14. The computer homework is relevant to the class.

1	2	3	4	5
strongly disagree				strongly agree

C. DISCUSSION SECTIONS

15. Number of discussion sections that you have attended: (out of 6)

1) zero
2) 1
3) 2 - 3
4) 4 - 5
5) all

16. Discussion section is organized.

1 2 3 4 5
strongly disagree strongly agree

17. Discussion sections aid problem-solving.

1 2 3 4 5
strongly disagree strongly agree

18. Discussion sections related to lecture materials.

1 2 3 4 5
strongly disagree strongly agree

19. The T.A. is willing to help.

1 2 3 4 5
strongly disagree strongly agree

20 Overall, discussion sections are helpful.

1 2 3 4 5
strongly disagree strongly agree

D. READING MATERIALS (TEXT)

20. The text: Statistics for Business by C.M. is easy to understand.

1 2 3 4 5
strongly disagree strongly agree

21. The Minitab Handbook by R.B.M. is easy to use.

1 2 3 4 5
strongly disagree strongly agree

E. STUDENTS

23. Number of lectures that you have missed. (out of 18)

1) >11
2) 9 - 11
3) 6 - 8
4) 3 - 5
5) 0 - 2

24. The time (hrs) including homework you spend for this course per week outside class:

1) zero
2) 1 - 3
3) 3 - 5
4) 5 - 7
5) >7

F. HOMEWORK

25. The amount and frequency of homework is appropriate.

1	2	3	4	5
strongly disagree				strongly agree

26. Homework enhances learning.

1	2	3	4	5
strongly disagree				strongly agree

27. Given the T.A.'s time constraints, the grading of the homework is fair.

1	2	3	4	5
strongly disagree				strongly agree

Appendix B

BUSINESS 570 SURVEY 2 11-7-90

Your discussion is: 301 302 303 304

A. **LECTURE**

1. The pace of this class is

   1) way too fast
   2) too fast
   3) about right
   4) too slow
   5) way too slow

2. Which of the following are problems with the black board presentation:

   _____ too small
   _____ too light
   _____ too low
   _____ erased materials too soon
   _____ no problem

3. Which of the following are problems with the overhead presentation:

   _____ too small
   _____ too light
   _____ too low
   _____ switched slides too fast
   _____ no problem

4. You can hear the Professor's voice clearly

   1 2 3 4 5
   strongly disagree strongly agree

5. Rate your overall satisfaction with the lecture

   1 2 3 4 5
   very unsatisfied very satisfied

B. **COMPUTER**

6. The instruction in using the computer is sufficient.

   1 2 3 4 5
   strongly disagree strongly agree

7. The additional computer instruction is helping you understand the homework.

   1 2 3 4 5
   strongly disagree strongly agree